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9. Significance of the Drainage Changes near Granville, Ohio, by Earl R. Scheffel.

10. Age of the Licking Narrows, by K. F. Mather. R. T. C.

College Geology. By THOMAS C. CHAMBERLIN AND ROLLIN D. SALISBURY. Pp. 978, with 21 plates and 608 text figures. New York: Henry Holt and Co., 1909.

This book is essentially an abbreviation of the author's three-volume *Geology*, which appeared in 1904–6, with some changes of matter and mode of treatment and with many new illustrations. R. T. C.

Experimentaluntersuchungen über die auscheidungsfolge von silikaten bei zwei und drei componenten. By R. FREIS. Neues Jahrbuch für Mineralogie. Beilage, Band XXIII, 1907. 47 pp., 13 figs., 3 pls.

Freis gives the results of his studies on the freezing and melting curves, differentiation phenomena, and the sequence of crystallization of the following components:

I. Diopside and anorthite.
II. Diopside and olivine.
III. Diopside and nepheline.
IV. Diopside, anorthite, and magnetite.
V. Diopside, olivine, and magnetite.
VI. Diopside, olivine, and anorthite.
VII. Diopside, olivine, and nepheline.
VIII. Diopside, olivine, and orthoclase.

Various proportions of the chemically pure mineral constituents were melted, and cooled to glass. These glasses were heated in the electric furnace and the following temperatures noted:

T_1. The mass softens and takes slight impressions.
T_2. The mass has become entirely liquid.
T_3. Initial freezing point.
T_4. Freezing completed.

The freezing and melting curves descend to a minimum, lying between the two extremes of composition in the two component systems, indicating the presence of eutectics. Eutectics were also observed in nearly all the three component systems. Undercooling was a marked characteristic of all the freezing curves.

The sequence of crystallization was uniform for all systems, and was independent of the mineral proportions, and eutectics. Eutectic texture was absent. The following was the observed order for all proportions in the respective systems:

I. Diopside, anorthite, diopside.
II. Diopside, olivine.
III. Diopside, nepheline.
IV. Magnetite, diopside, augite, and anorthite.
V. Magnetite, olivine, and augite.
VI. Olivine, diopside, anorthite, and diopside.
VII. Olivine, diopside, and nepheline.
VIII. Olivine, diopside, and orthoclase.

Freis believes that the crystallization sequence followed Rosenbusch's law of increasing acidity of the magma, influenced by undercooling, the force of crystallization, and the solubility law of Nernst.

Differentiation phenomena consisting of local, ill-defined crystal aggregations or schlieren; sharply defined segregations of certain mineral aggregates; local variations in grain; and segregation in the inverse order of specific gravity were observed. Magnetite seemed to be segregated near the top of the melt. Forsterite or iron-free olivine, formed at the bottom, while iron-bearing diopside occupied an intermediate zone.

The order of crystallization and the differentiation phenomena observed by Freis therefore differ in many ways from certain generally accepted theoretical views on magmas.

E. S.